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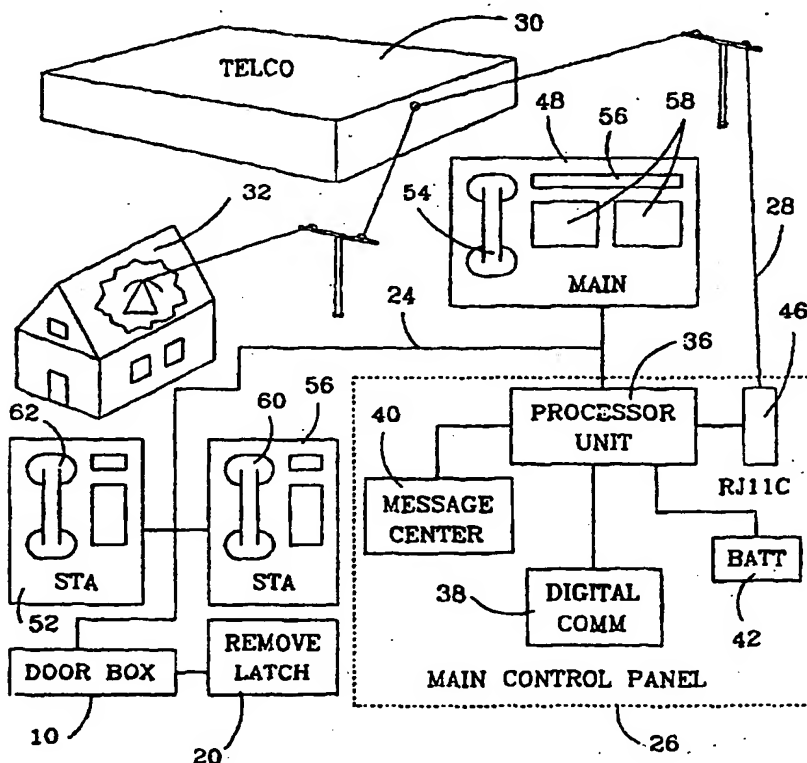
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(54) Title: CALL FORWARDING SYSTEM FOR DOORBELL/INTERCOM BOX

**(57) Abstract**

A door box call forwarding system includes a door box (10) having associated therewith a speaker (16) and a microphone (14). The doorbell (18) is operable to be depressed and transmit a signal to a control station (26). The control station (26) includes a processing unit (36) which is operable in a normal operating mode to effect a voice channel with auxiliary stations (28). In a remote mode, the processing unit (36) is operable to retrieve from a lookup table the phone number of a remote residence (32). Upon receiving a command from the door box (10) that the doorbell (18) has been depressed, the remote location (32) is accessed by dialing the phone number stored in the lookup table and, upon detecting an off-hook condition, effecting a voice channel between the door box (10) and the telephone at the remote location (32). The telephone at the remote location (32) can be utilized to transmit control signals to the processor unit (36) to perform select operations such as activating a remote latch (20). Further, the processor unit (36) can access the telephone at the remote location (32) prior to effecting the voice channel. The telephone at the remote location (32) can then be utilized to determine whether the voice channel is effected.



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## **CALL FORWARDING SYSTEM FOR DOORBELL/INTERCOM BOX**

### **TECHNICAL FIELD OF THE INVENTION**

The present invention pertains in general to intercom systems, and more particularly, to the portion of the intercom system that allows a remote station to communicate with an outdoor doorbell station and allows the remote station to be disposed on the outside of a telephone central office.

## BACKGROUND OF THE INVENTION

Intercom systems typically incorporate a speaker at the door. When the doorbell is rung, the intercom system will generate a chime and transmit this chime to all the active remote stations within the intercom system. A user can then depress a button typically labelled "DOOR" in conjunction with a button labelled "TALK" to transmit voice to the speaker at the doorbell box. By releasing the "TALK" button, the user can then listen to an individual at the door and, therefore, carry on a conversation.

One of the disadvantages to present intercom systems is that when an individual is away from his home, the doorbell is unanswered. This would allow an individual to determine if the house was vacant. Some systems have actually utilized tapes of dogs barking, etc. to deceive a potential burglar into thinking that the house was in fact occupied. However, none of these systems at present allow a user at a remote location away from the house to converse with the person at the door.

## SUMMARY OF THE INVENTION

The present invention disclosed and claimed herein comprises a door box forwarding system. The system includes a door speaker/microphone combination disposed at the door of a residence for allowing two-way voice communication.

- 5 A doorbell switch is associated with the door speaker/microphone combination and the switch is depressible to indicate the presence of an individual at the door. A lookup table is provided for storing at least one address of a remote location. The processing unit is operable in response to activation of the switch to access the lookup table at the address of the remote location. A voice channel is then
- 10 effected between the door speaker/microphone combination and the remote location in accordance with the at least one address.

## BRIEF DESCRIPTION OF THE DRAWINGS

For a more complete understanding of the present invention and the advantages thereof, reference is now made to the following description taken in conjunction with the accompanying Drawings in which:

5           FIGURE 1 illustrates an overall diagrammatic view of the system of the present invention;

          FIGURE 2 illustrates a more detailed diagram of the control system and the remote stations;

          FIGURE 3 illustrates a detailed diagram of the control system;

10           FIGURE 4 illustrates a detailed block diagram of the door box of FIGURE 3;

          FIGURE 5 illustrates a flowchart for the overall remote door operation, including local door operation;

15           FIGURE 6 illustrates a flowchart of the steps required to access local stations for communication with the doorbell box; and

          FIGURE 7 illustrates a flowchart for the operation of accessing a remote location for connecting to the doorbell box.

## DETAILED DESCRIPTION OF THE INVENTION

Referring now to FIGURE 1, there is illustrated a diagrammatic view of the overall system of the present invention. A doorbell box 10 is disposed on the door 12 in a residence. The doorbell box 10 contains a speaker 16, a microphone 14 and a doorbell switch 18. The doorbell box 10 also interfaces with a remote latch 20, which remote latch 20 is operable to be controlled from a remote location to unlock the door and allow individuals to enter.

The doorbell box 10 is connected through two wires 22, which form part of a communication trunk 24, to allow communication with a control station 26. The control station 26 is a centralized station which is disposed on a wall in the residence in which the door 12 is disposed and is operable to interface with a plurality of auxiliary stations. These auxiliary stations 26 can be phones, intercom speakers, radios, etc. The system communicates with all of the auxiliary stations 28 and the door box 10 through the trunk 24. However, a wireless connection can also be provided.

The control station 26 is also connected through a telephone wire 28 to a public telephone system 30. The public telephone system 30 is connected to other residences, such as a residence 32 illustrated in FIGURE 1, to allow the control stations 26 to communicate with the residence 32.

In the operation of the system of the present invention, the control station 26 detects depression of the doorbell 18 and then performs one of two steps. In a first normal operating mode, the control station 26 will generate a chime at each of the auxiliary stations 28 having a speaker associated therewith. If this mode is chosen, a user can then utilize the auxiliary station to effect a voice channel with the speaker 16 and the microphone 14 and talk to the individual that depressed the doorbell button 18. Additionally, the user can

control the door latch 20 through the lines 22 and the control station 26 to unlatch the door from the remote auxiliary station 24.

5 In a second mode of operation, the control station 26 can be set such that, upon detection of depression of the doorbell switch 18, the user can make a call to the residence 32. Upon detecting an off-hook condition, a voice channel will then be opened between the telephone line 28 and the speaker 16 and microphone 14, such that the individual answering the phone at the residence 32 will now be able to talk to the individual at the door box 10, unknown to that individual. Further, the individual in the residence 32 can remotely unlatch the remote latch 20. Additionally, a prompt can be provided by the control station 10 26 to the remote station 32 prior to effecting a voice channel between the telephone at the residence 32 and the box 10. This will allow the individual to decide not to answer the phone. The system would then respond to the depression of a button on the telephone panel at the residence 32 in order to effect the voice channel. 15

Referring now to FIGURE 2, there is illustrated a more detailed diagram of the overall system. The control unit 26 is generally disposed within a main control panel on one of the walls in the residence as described above. Typically, a processor unit 36 is disposed at the heart of the control panel 26, the processor unit containing all of the memory, program memory instructions and logic 20 necessary to interface with all of the auxiliary stations 28 and also with the public telephone system 30. The control unit 26 can also contain a digital communicator 38 and a message center 40. The digital communicator 38 is system that allows prerecorded messages or prompts to be stored and, upon detecting an "event" 25 from a processor unit 36, the digital communicator can then effect a communication link through the processor unit 36 with the telephone system 30 to transmit the message to a recipient telephone number. Digital communicators 38 are well-known in the security field and are merely smart dialers.



The message center 40 is a local message center which allows incoming calls from the telephone company 30 to be handled by the processor unit 36 and stored in the message center 43. The message center is a cassette in the preferred embodiment, but could be a digital recording system. Further, the message center 40 could contain voice messaging features for use by the intercom system. Additionally, a battery 42 is provided to provide backup power, the primary power being derived from an A/C power source at the residence (not shown). The processor unit 36 communicates with the telephone system 30 through an RJ11C jack 46 and with the various auxiliary stations 28 through the trunk 24. There are a number of different types of auxiliary stations available, with only two types illustrated, a main station 48 and two substations 50 and 52. The main station 48 is basically comprised of a telephone handset 54, a display 56 and a keypad portion 58. Further, a speaker (not shown) is provided. The keypad 58 contains all necessary keys to operate the system and interface with the processor unit 36. The substations 50 and 52 each have a handset 60 and 62, respectively, and also have a display and keypad, but with significantly less functions than the display 56 and keypad 58 of the main station 48.

Each of the main auxiliary stations 48 and the substations 50 and 52 can access the control unit 26 when the doorbell 18 on the door box 10 is pressed. In this situation, the processor unit 36 would detect depression of the key switch associated with the doorbell 18 and then generate a chime for transmission to the speakers associated with all the auxiliary stations. The user could then either pick up the associated handset or press an associated button to utilize the external speaker (not shown) associated with each of the auxiliary stations. A voice channel could then be effected through an audio switch associated with the processor unit 36, as will be described hereinbelow.

Referring now to FIGURE 3, there is illustrated a general block diagram of the processor unit 36. The processor unit 36 generally has associated therewith a central processing unit (CPU) 66 which is any microprocessor based

system having associated therewith address and data buses and various bus control and I/O control systems. These are conventional. A memory 68 is provided which is comprised of both Read Only Memory (ROM) and Random Access Memory (RAM). The memory is utilized for storing instructions in the non-volatile ROM memory and for storing data in the volatile RAM memory. The transmission of control signals between the CPU 66 and the auxiliary stations 28 is effected through a digital I/O circuit 70 and a digital communication bus 72. The digital communication bus 72 is part of the trunk 24, which is routed to each of the stations. This allows control signals to be transferred between the CPU 66 and the auxiliary stations 28.

The auxiliary stations 28 each have an audio channel associated therewith. This audio channel is connected to a cross-point switch matrix 74 through an audio trunk 76, which audio trunk 76 is part of the trunk 24. A separate audio line is provided for each of the stations and also, additionally, the cross-point switch 74 is connected to the telephone line through a hybrid transformer 78 and also to the door box 10 through an output pair of lines 80. The lines 80 are input to an amplifier 82, which is operable to drive a transformer 84 and also receive input from the transformer 84. Therefore, the amplifier 82 provides for duplex operation, i.e., voice to be transmitted in both directions. The transformer 84 is a conventional transformer and is connected to a door control box 86. The door control box 86 is operable to be disposed at the door and interfaced with a microphone 88, a speaker 90 and a door latch 92, in addition to a doorbell switch 91. In operation, the doorbell switch 91 can be depressed and initiate a chime throughout the system. Although, as will be described herein, depression of the switch 91 can activate a voice forwarding operation such that the doorbell can be answered over the telephone line. After the doorbell switch 91 has been depressed, the system can then effect a connection with the speaker 90 such that voice can be transmitted to the individual at the control box 86. The individual at the door control box 86 is then allowed to converse through the microphone 88. In addition, the user can

remotely activate a door latch 98 which is operable to open a door. The door latch 92 is controlled through the door control box 86 via control lines 83. Control lines 83 allow power to be passed to the door control box 86 and also to control lines to be supplied to the door latch 92.

5 Referring now to FIGURE 4, there is illustrated a more detailed circuit diagram of the door control box 86. The transformer 84 has the secondary thereof connected between the positive voltage node 85 and a node 87. The node 87 is connected through a resistor 89 and series connected capacitor 93 to the base of an NPN transistor 94. The collector of transistor 94 is connected to a  
10 node 96 and the emitter of transistor 94 is connected through a parallel configured resistor 97 and capacitor 98 to ground. The node 96 is also connected through a capacitor 99 to ground. The base of transistor 94 is connected through a resistor 100 to the cathode of a xenon diode 101, the anode thereof connected to ground. The diode 101 therefore provides a reference voltage for the base of  
15 transistor 94.

The node 87 is connected through a resistor 102 to a node 103, node 103 connected through ground to a resistor 104. Node 103 is driven by the emitter of an NPN transistor 105, the base thereof connected to the power supply node 85 through a resistor 106 and to ground through a resistor 108. The collector of  
20 transistor 105 is connected to the positive supply node 85 through a resistor 107 and to ground through a capacitor 109. The base of transistor 105 is connected through a capacitor 110 to one side of the microphone 88, one side of the microphone 88 also connected to one side of a variable resistor 111. The wiper of the variable resistor 111 is connected to ground through a capacitor 112 and  
25 also to a node 114 through a resistor 113. Node 114 is connected through a transformer 116 to a node 118. Node 118 is connected to ground through a capacitor 117 and also to one side of a transformer 120 through a resistor 119. The other side of the primary on transformer 120 is connected to node 96. The secondary of the transformer 120 is connected to the speaker 90. The node 114

10

is connected to the cathode of a diode 122, the anode thereof connected to the positive supply node 85.

5 The positive node 85 and the ground node are connected to the positive and negative terminals of a bridge rectifier circuit 24, the input to the bridge rectifier circuit input to control lines 126. The door switch 91 is configured in series with a resistor 125 and connected across the input lines 126.

10 In operation, a signal can be impressed on the primary of the transfer 84 and then across the secondary of the transformer on nodes 85 and 87. This is then input to the base of transistor 94 to drive one side of transformer 120 to provide an output to the speaker. The microphone 88, which is disposed between the variable resistor 111 and ground, has the output voltage thereof impressed on the base of the transistor 105, which then drives node 103 to drive the transformer 84.

15 Referring now to FIGURE 5, there is illustrated a flowchart depicting the overall operation of the call forwarding system for the doorbell. The program is initiated at a start block 131 and proceeds to a decision block 133 to determine if the doorbell has been rung by detecting the ring signal. If not, the program flows along an "N" path back to the input of the decision block 133. When the ring is detected, the program flows along the "Y" path to a function block 115 to access the lookup table. The lookup table has associated therewith the addresses of all of the auxiliary stations 28 and also the access information to perform a dial-out to a remote location in the event that a remote operation is indicated. Once the lookup table has been accessed, the program flows to a decision block 137 to determine whether the remote operation has been selected. 20 This remote operation is typically selected by the user when leaving the premises. This is a code that is input at the main auxiliary panel 48. A flag is therefore set which can be looked at. If this flag is set, this indicates that the remote operation

is selected and the program flows along a "Y" path from the decision block 137 to a function block 139 to access the remote location. However, if the flag is not set, the program flows along an "N" path from the decision block 137 to a function block 141 to access the local stations.

5           Referring now to FIGURE 6, there is illustrated a flowchart depicting the operation of accessing the local station, which is initiated at a start block 143. The program then flows to a function block 145 to generate the chime locally, which chime will be output on the speaker associated with the auxiliary stations 28. The program then flows to a decision block 147 to determine if the "door"  
10   button on any of the auxiliary stations 28 has been pressed, indicating that the user wishes to effect the voice channel with the individual at the door. If not, the program flows along an "N" path to a timeout decision block 128 which determines if a timeout period has occurred. If not, the program flows back to the input of decision block 147. After a predetermined time, the program will  
15   flow from the timeout decision block 128 to an END block 130. When the door button is depressed, the program will flow from the decision block 147 along a "Y" path to a function block 132 to connect the door speaker and microphone at the door box 10 to the requesting one of the auxiliary stations. The program then flows to a decision block 134 to determine whether the door latch is to be  
20   released. If so, the program flows along the "Y" path to a function block 136 to release the latch and then to a decision block 138 to determine whether the program is to be terminated. However, if the latch is not to be released, the program will flow from decision block 134 along the "N" path to the input of decision block 138. If the program is not to be terminated, the program then  
25   flows from the decision block 138 along the "N" path to the input of the decision block 134. When the program is to be terminated, the program flows along the "Y" path to an END block 140. This would occur when either the user had broken the connection by releasing the Door button or a code has been input at the auxiliary station 28.

Referring now to FIGURE 7, there is illustrated a flowchart depicting the operation for accessing remote locations, which is initiated at a start block 146. The program then flows to a decision block 148 to determine if a dial tone has been detected. If not, the program flows to a timeout decision block 150 to determine if a timeout has occurred. If so, the program flows along the "Y" path to an END block 152 and, if not, the program flows along a "N" path to the input of decision block 148. When the dial tone has been detected, the program flows along the "Y" path to a function block 154 to send a dial string which is in the access lookup table. This dial string typically was entered by the user prior to leaving the premises and is stored in an access lookup table. When the flag indicating a remote operation is set, this is the number that is accessed. This dial string is then assembled and output through the telephone system 30.

After the dial string has been transmitted, the program flows to a decision block 156 to determine if an off-hook condition has occurred, i.e., the ringing has stopped. If the off-hook condition has not occurred, the program flows along an "N" path to a timeout display block 158 to determine if a predetermined timeout has occurred. If so, the program flows along a "Y" path to the END block 152 and, if not, the program flows along an "N" path back to the input of decision block 156.

When the off-hook condition has been detected, the program flows along the "Y" path from the decision block 156 to a function block 162, wherein the door speaker and microphone are connected to the telephone line by the cross-point switch 74, thus effecting a voice channel between the user at the other end of the telephone line and the door speaker and microphone. The program then flows to a function block 164 to determine whether a latch release command has been received. This latch command would be in the form of a DTMF tone that was received from the telephone line. In this mode, a DTMF decoder would be incorporated into the CPU 66 or into the cross-point switch matrix 74. This is a conventional circuit and is not illustrated. If the latch release command has been

received, the program flows along a "Y" path to a function block 166 to release the door latch 20 and, if not, the program flows along an "N" path to a terminate decision block 168. After releasing the latch, the program also flows from the function block 166 to the input of decision block 168. The decision block 168  
5 determines whether an on-hook condition has occurred from the remote station or a code has been input indicating such an operation. If not, the program flows along an "N" path back to the input of decision block 164 and, if so, the program flows along the "Y" path to an END block 170.

In summary, there has been provided a call forwarding system that  
10 allows a voice communication channel to be opened between a speaker on a door box associated with an intercom system at a remote location. This system includes a central processing unit that is operable to sense when a button at the door box has been depressed, indicating that an individual desires to ring a doorbell. Upon sensing the depression of the doorbell switch and receiving the  
15 indication that the call is to be forwarded, the CPU then accesses a lookup table to determine the phone number of where the voice channel is to be routed. A dial string is then assembled and sent out to the telephone system and, upon detecting an off-hook condition, a voice channel is effected between the speaker at the door box and the remote location. Upon receiving an on-hook condition or  
20 a timeout condition, the connection is then broken. Additionally, the user at the remote location can remotely access a door latch to allow the door to be opened and allow the individual to enter the premises.

Although the preferred embodiment has been described in detail, it should be understood that various changes, substitutions and alterations can be  
25 made therein without departing from the spirit and scope of the invention as defined by the appended claims.

**WHAT IS CLAIMED IS:**

1. A door box forwarding system, comprising:
  - a door speaker/microphone combination disposed at the door of a residence for allowing two-way voice communication;
  - a doorbell switch associated with said door speaker/microphone combination, which said switch is depressible to indicate the presence of an individual at the door;
  - a lookup table for storing at least one address of a remote location; and
  - a processing unit operable in response to activation of said switch to access said lookup table and effect a voice channel between said door speaker/microphone combination and said remote location in accordance with said accessed at least one address.
2. The door box forwarding system of Claim 1, wherein said processing unit further includes means for accessing said remote location through a telephone system, said at least one address comprising the telephone number of said remote location on said telephone system.



3. The door box forwarding system of Claim 1, wherein said processing unit is operable to work in a normal operation mode and in a call-forwarding mode and further comprising:

a plurality of auxiliary stations disposed at the residence;

chime means for generating a chime; and

said processing unit operable in said normal operating mode to control said chime means to generate a chime in response to depression of said switch and operable in response to control signals received from said auxiliary stations to effect a voice channel between said door speaker/microphone combination and the one of said auxiliary stations from which control signals have been received.

4. The door box forwarding system of Claim 3, and further comprising a call forwarding indicator that is activated by a user and, when activated, controls said processing unit to operate in the call-forwarding mode, said processing unit operating in the call-forwarding mode in response to activation of said call forwarding indicator by the user.

5. The door box forwarding system of Claim 1, wherein said processing unit includes means for assessing said remote location in accordance with said at least one address and providing a prompt to said remote location after access thereof and prior to effecting a voice channel between said door speaker/microphone combination and said remote location, said processing unit operable to receive control signals from said remote location and, in response thereto, effect said voice channel between said door speaker/microphone combination and said remote location.

6. The door box forwarding system of Claim 1, and further comprising a door latch for being activated by said processing unit, said processing unit operable to activate said door latch in response to a signal received from said remote location after effecting said voice channel between said door speaker/microphone combination and said remote location.
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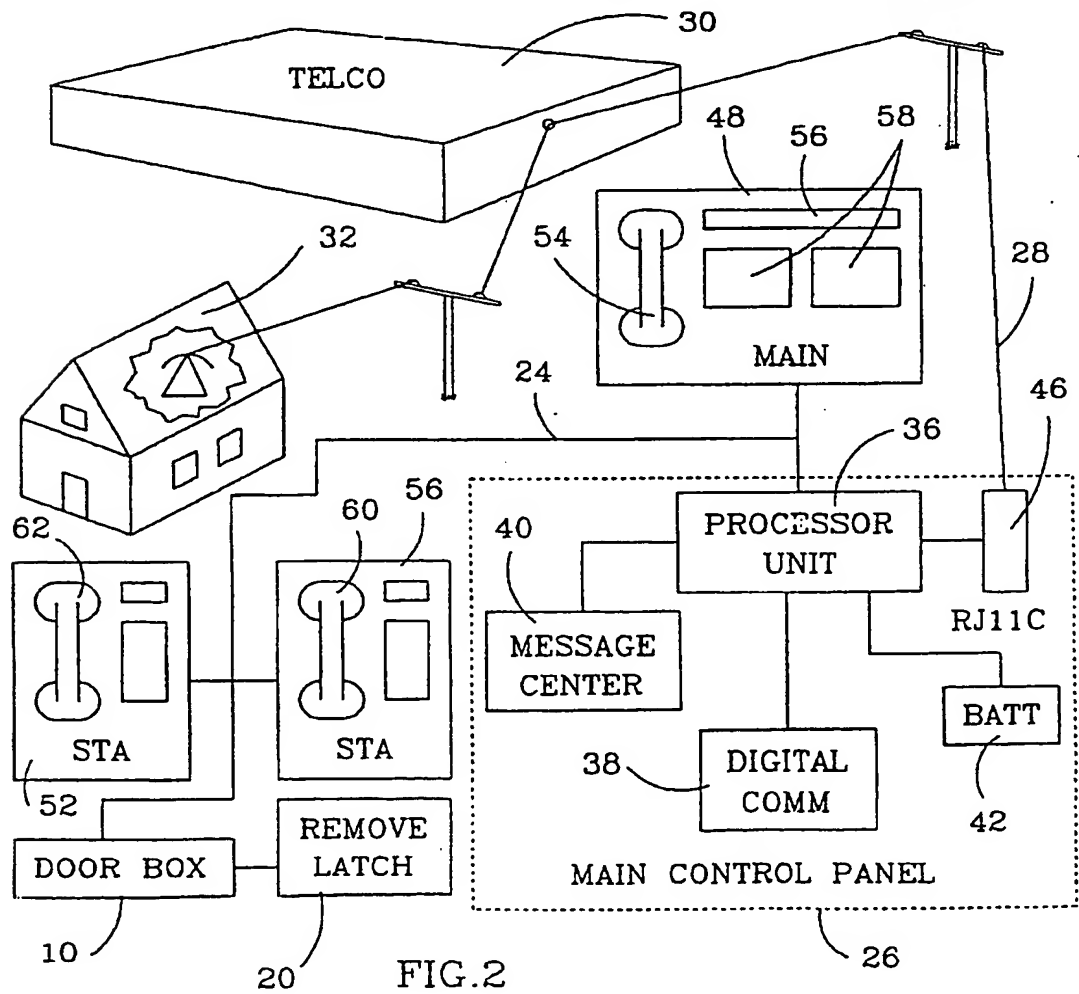
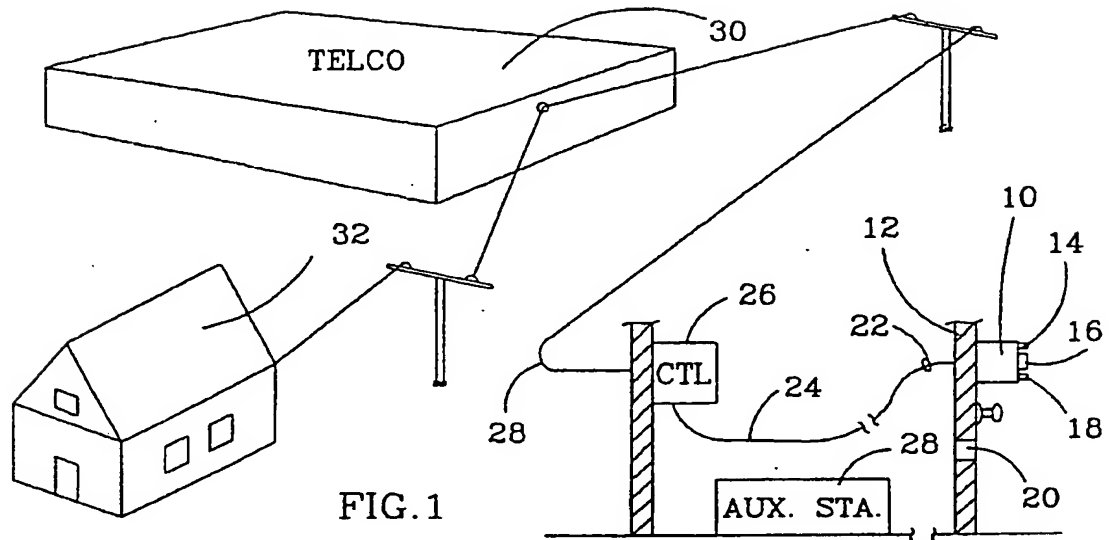
7. A method for effecting a voice communication link between a door speaker/microphone combination disposed at a door of a residence and a remote location, comprising:

- 5 disposing a doorbell switch in association with the door speaker/  
microphone combination at the door;
- storing an address in a lookup table, the address associated with  
the remote location;
- activating the switch in order to indicate the presence of an  
individual at the door;
- 10 accessing the address stored in the lookup table in response to  
activation of the switch; and
- accessing the remote location after access of the address, and  
effecting a voice channel between the door speaker/microphone combination and  
the remote location in accordance with the accessed address.

8. The method of Claim 7, wherein the remote location is accessed prior to effecting the voice channel between the speaker/microphone combination and the remote location and further comprising generating an access signal at the remote location and effecting the voice channel between the door speaker/  
5 microphone and remote location after the generation of the activation signal at the remote location and transmission thereof to the residence.

9. The method of Claim 7, wherein the step of effecting the voice channel comprises effecting the voice channel over a telephone system wherein the address stored in the lookup table comprises a telephone number on the telephone system associated with the remote location.

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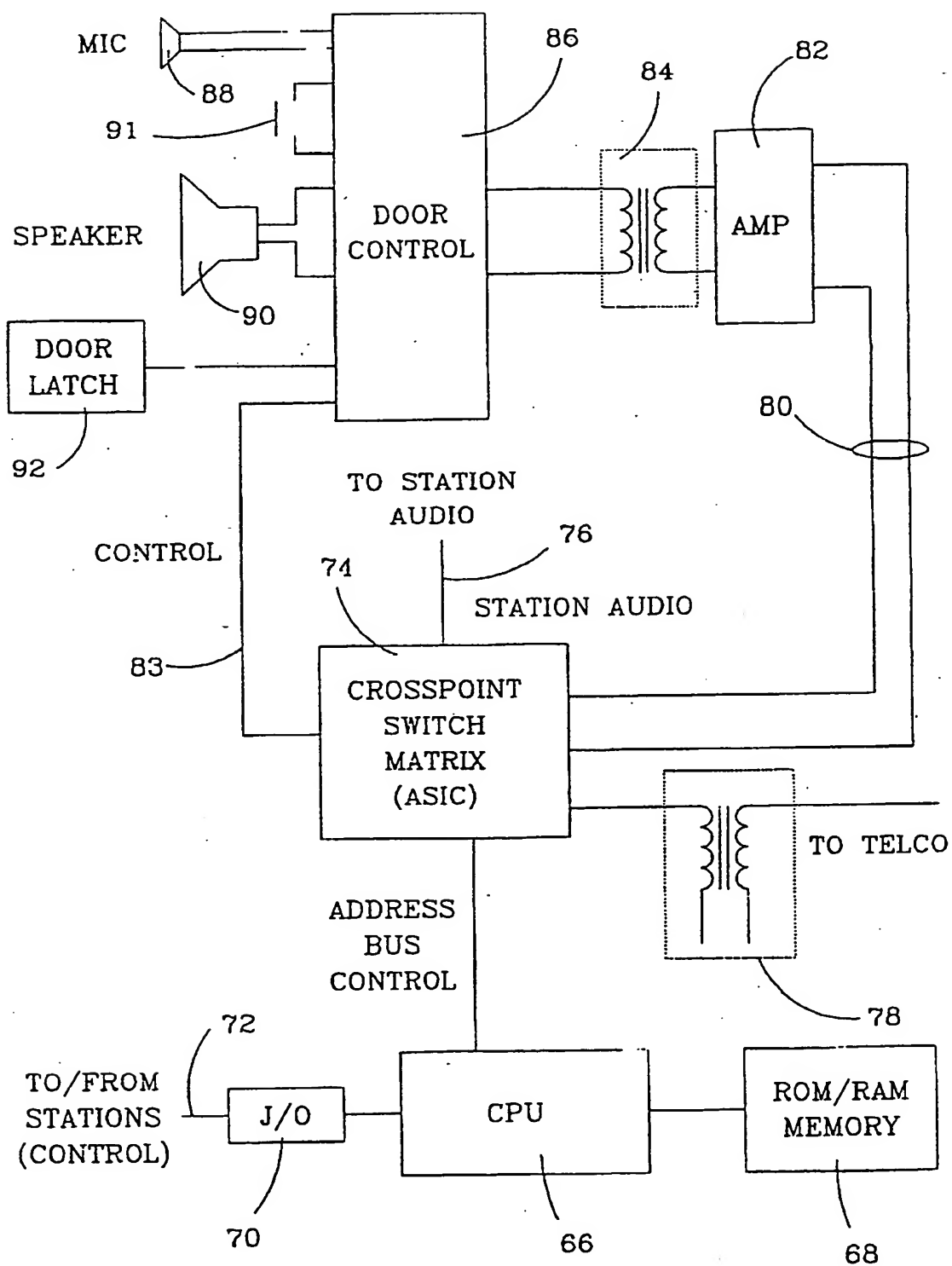


FIG. 3

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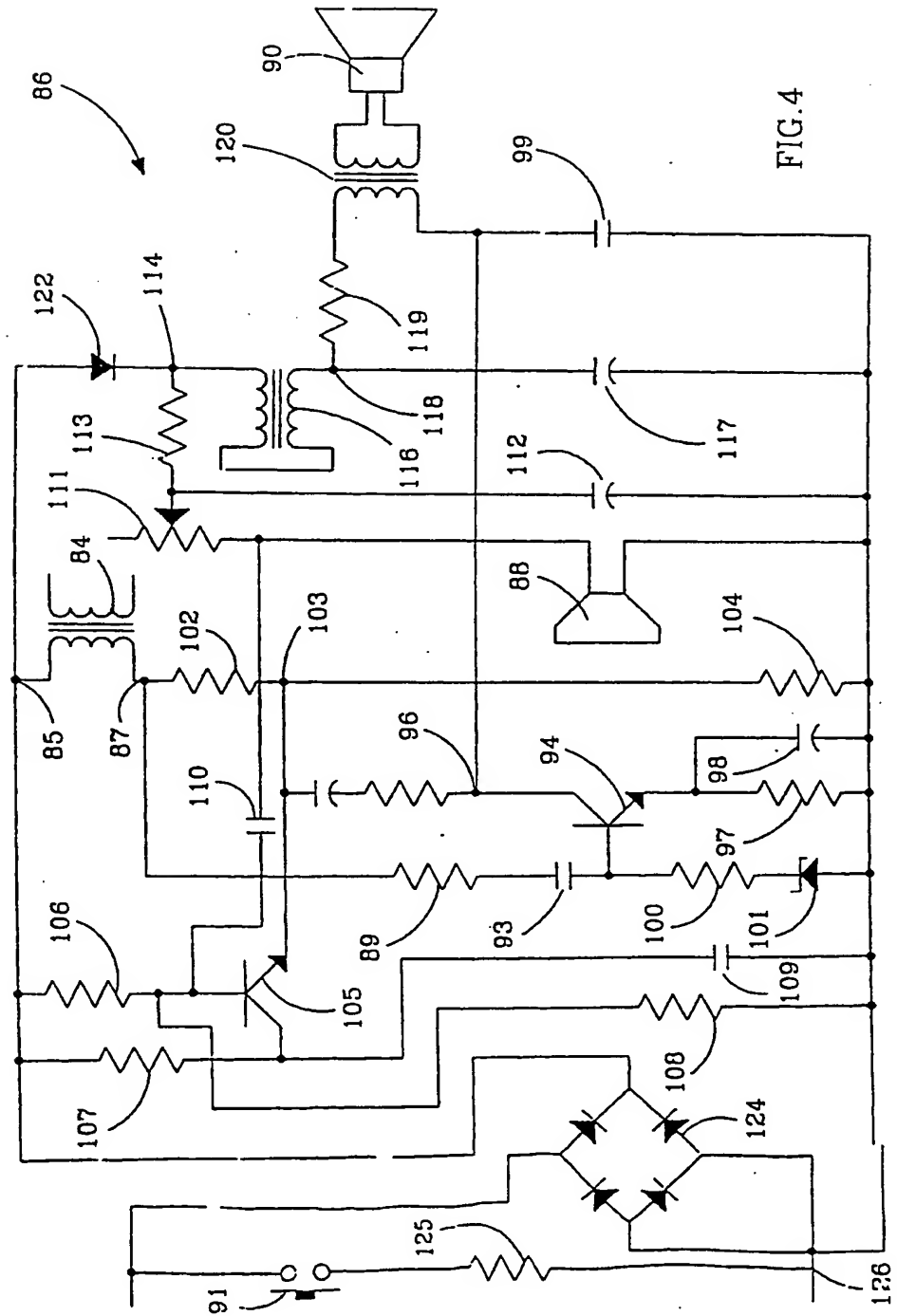


FIG. 4

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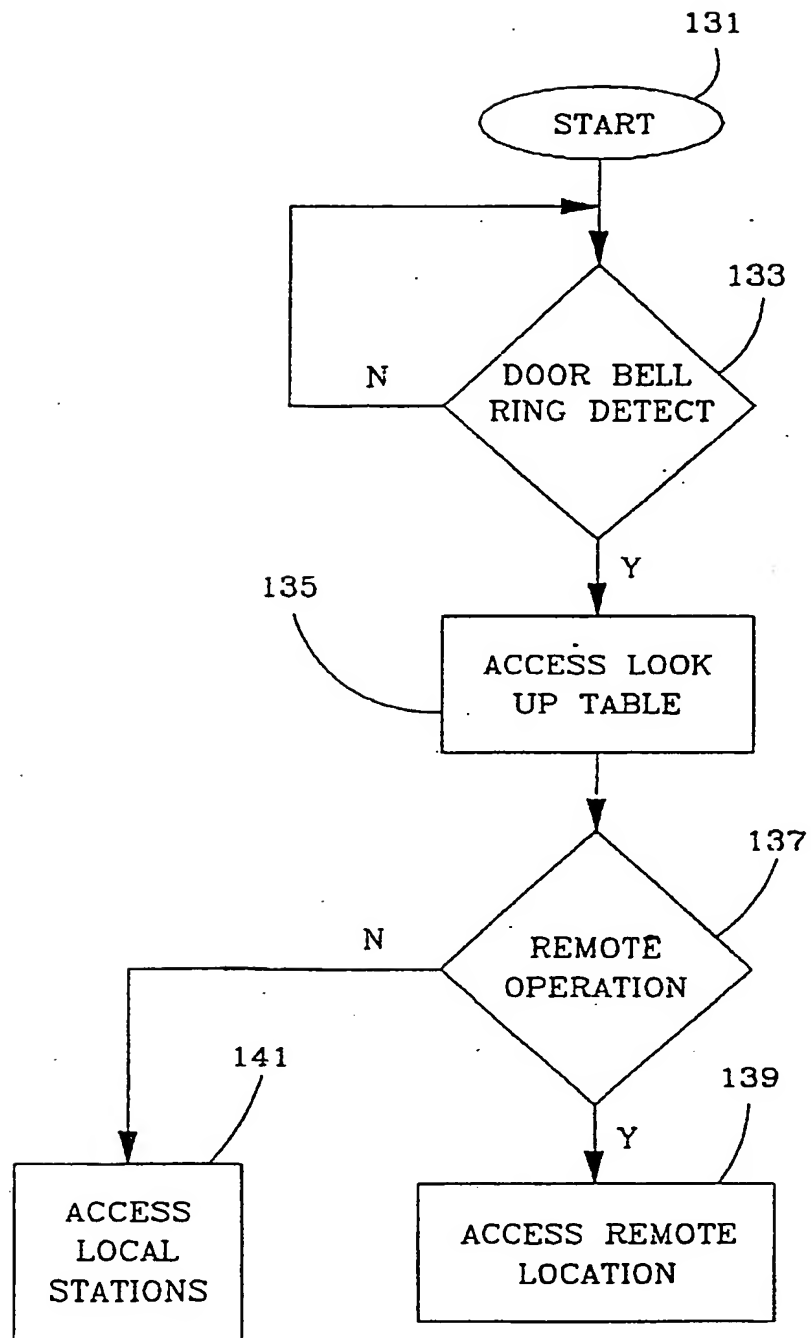


FIG.5

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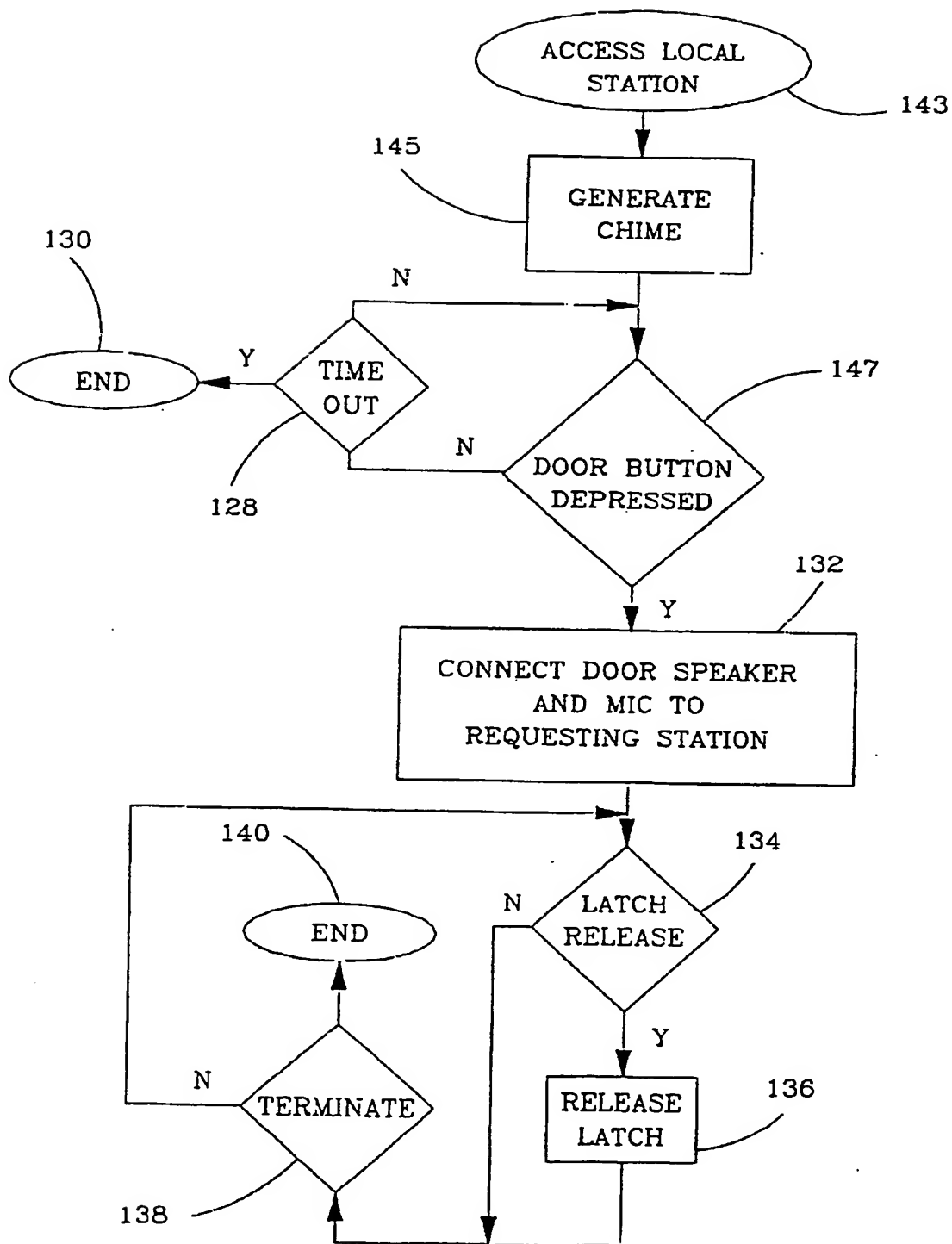


FIG. 6



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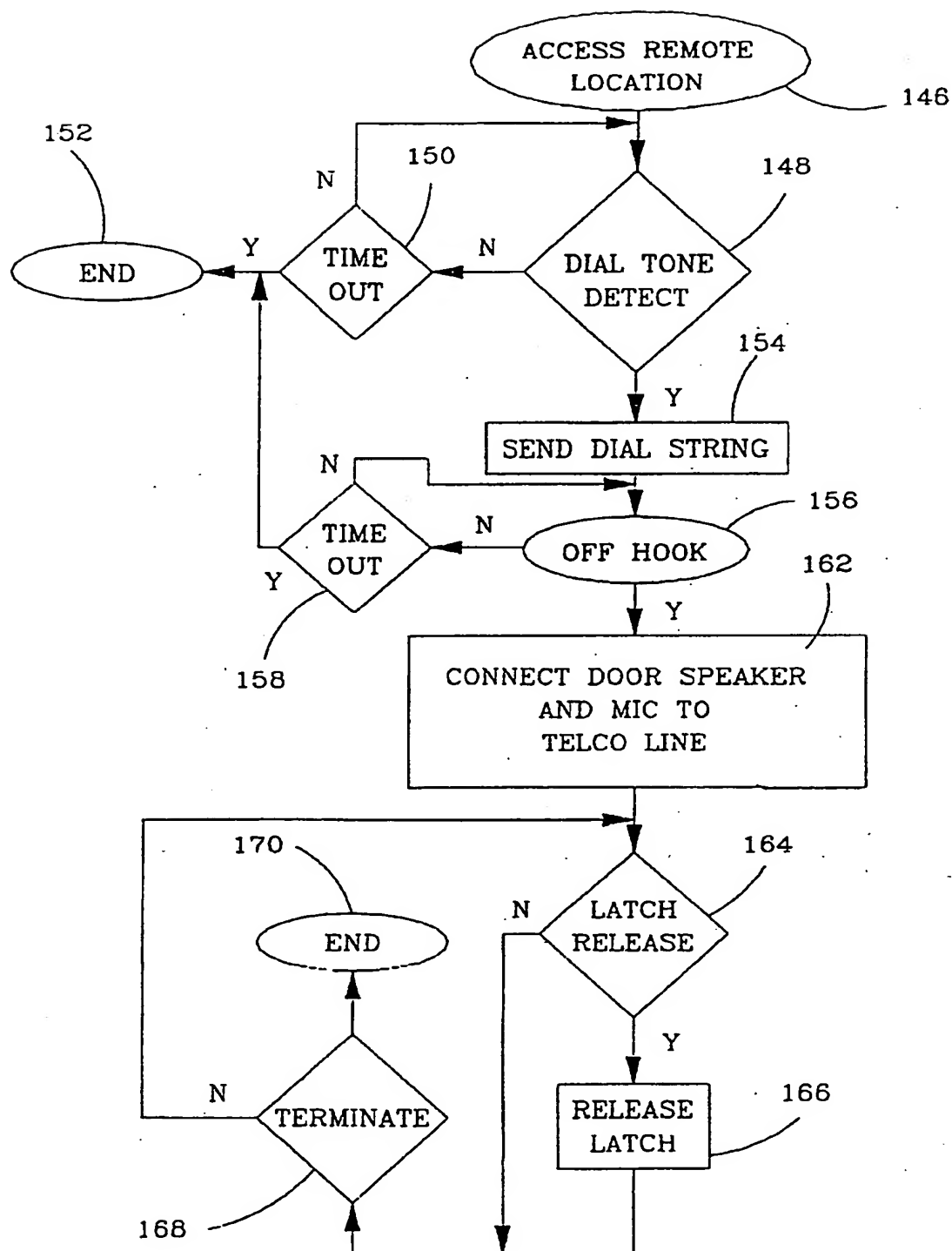


FIG. 7

## INTERNATIONAL SEARCH REPORT

International application No.  
PCT/US94/10340

**A. CLASSIFICATION OF SUBJECT MATTER**

IPC(5) : H04M 1/00, 11/00

US CL : 379/157, 103

According to International Patent Classification (IPC) or to both national classification and IPC

**B. FIELDS SEARCHED**

Minimum documentation searched (classification system followed by classification symbols)

U.S. : 379/157, 103, 355

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

APS

**C. DOCUMENTS CONSIDERED TO BE RELEVANT**

| Category*    | Citation of document, with indication, where appropriate, of the relevant passages                        | Relevant to claim No. |
|--------------|---|-----------------------|
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| Y            | US, A, 4,113,986 (CLEMENT ET AL) 12 September 1978, See Abstract  | 6                     |
| A            | US, A, 4,987,589 (TRELL) 22 January 1991, See entire document   | 1-9                   |
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| A            | US, A, 5,046,083 (TRELL) 03 September 1991, See entire document   | 1-9                   |



Further documents are listed in the continuation of Box C.



See patent family annex.

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Date of the actual completion of the international search

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